

The [Delft Center for Systems and Control](#) (DCSC) of [Delft University of Technology](#), The Netherlands has a vacancy for a 4-year **PhD position** on

## **Performance guarantees in integrated optimization-based & learning-based control of networks with hybrid dynamics**

### **Project description**

This PhD project is part of the European ERC Advanced Grant project CLariNet – a novel control paradigm for large-scale hybrid networks. The goal of CLariNet is to create a completely new paradigm for control of large-scale networks with hybrid dynamics (i.e., systems with a combination of continuous dynamics and event-driven dynamics or switching) by bridging the gap between optimization-based control and learning-based control. The breakthrough idea is to bridge that gap by using piecewise affine models and to unite the optimality of optimization-based control with the on-line tractability of learning-based control.

The aim of this PhD project is to develop integrated optimization-based and learning-based control method for constrained hybrid systems with performance guarantees. In particular, we will develop integrated optimization-based and learning-based control methods for piecewise affine (PWA) systems subject to input, output, and state constraints with performance guarantees in terms of optimality, constraint satisfaction, stability, safety, etc. For the cases where formal performance guarantees cannot be derived, probabilistic guarantees as used in, e.g., randomized algorithms will be derived instead. We will also consider issues such as computational complexity, error bounds, robustness, finite termination effects, etc. We will also investigate and characterize the various trade-offs (e.g., between accuracy/granularity of the system model and computational efficiency, and between allowed computation time and control performance/constraint violations).

This PhD project has a fundamental flavor. In addition, applications for the case studies include multi-modal transportation networks, smart multi-energy networks, and integrated intelligent transportation and energy systems.

### **What do we ask?**

We are looking for a candidate with an MSc degree in systems and control, applied mathematics, computer science, electrical engineering, or a related field, and with a strong background or interest in systems & control, machine learning, and formal analysis. The candidate is expected to work on the boundary of several research domains. A good command of the English language is required.

### **What do we offer?**

We offer the opportunity to do scientifically challenging research in a multi-disciplinary research group. The appointment will be for up to 4 years. The PhD student will also be able to participate in the research school DISC (<https://www.disc.tudelft.nl>). As an employee of the university you will receive a competitive salary starting of EUR 2541 gross per month in the first year and rising to a maximum of EUR 3247 gross per month based on a full-time appointment, as well as excellent secondary benefits in accordance with the Collective Agreement (CAO) of the Association of Universities in the Netherlands (VSNU). Assistance with accommodation can be arranged.

### **How to apply?**

Are you interested in this vacancy? Please apply by Sept. 15, 2022 via the application webpage <https://www.tudelft.nl/over-tu-delft/werken-bij-tu-delft/vacatures/details?jobId=7920> and upload your

letter of application along with a detailed curriculum vitae, a motivation why the proposed research topic interests you, a list of publications (if applicable), the abstract and/or summary of your MSc thesis, your BSc and MSc course program and the corresponding marks, names and addresses of two to three reference persons, and all other information that might be relevant to your application. More information on this position can be obtained from Bart De Schutter (email: b.deschutter \_at\_ tudelft.nl).

The application deadline for the position is Sept. 15, 2022. However, the position will stay open until a suitable candidate has been found.